IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN THE MATTER OF THE PATENT APPLICATION

OF: Takeshi NARUO et al. |

USSN: TO BE ASSIGNED – NEW |

FILED: July 2, 2003

FOR: WOOD GOLF CLUB HEAD DESIGNED TO DESCRIBE THE OPTIMUM
     TRAJECTORY OF A GOLF BALL

MS PATENT APPLICATION
COMMISSIONER FOR PATENTS
P.O. BOX 1450
ALEXANDRIA, VA   22313-1450   July 2, 2003

SECOND VOLUNTARY AMENDMENT

Dear Sir:

After granting a filing date and calculating the filing fee for
this new patent application, but before the first examination,
please amend the application as follows.

In the Claims:

Claims **1 to 3** are maintained unchanged.

Claims **4 to 12** have been cancelled in the First Preliminary
Amendment filed simultaneously herewith and with this new patent
application.

Please enter new claims **13 to 29** as follows.

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13. (new) The wood golf club head according to claim 1, wherein said ellipse is determined by solving the equation of motion using the following equations:

$$F_X(t) = -\tfrac{1}{2}(C_D(t)\cos\alpha + C_L(t)\sin\alpha)\,\rho A V_B(t)^2$$

$$F_Y(t) = -\tfrac{1}{2}(C_D(t)\sin\alpha - C_L(t)\cos\alpha)\,\rho A V_B(t)^2 - mg$$

$$N(t+\Delta t) = -\rho A d C_m(t) V_B(t)^2\,\Delta t/(4\pi I) + N(t)$$

wherein $F_X(t)$ is force applied to a ball in flight in the flight direction at time instant t, $F_Y(t)$ is force applied to a ball in flight in the vertical direction at time instant t, and $N(t+\Delta t)$ is decrease in the rotational speed of a ball due to aerodynamic torque after interval of Δt; and

wherein C_D: drag coefficient, C_L: lift coefficient, α: elevation angle of a ball(deg), ρ: air density(kg/m^3), A: ball sectional area(m^2), V_B: ball velocity(m/sec), m: ball mass(kg), g: gravitational acceleration(m/sec^2), C_m: moment coefficient, d: ball diameter(m), I: moment of inertia of a ball (kg/m^2), N: ball rotational speed(rps).

14. (new) The wood golf club head according to claim 2, wherein said ellipse is determined by solving the equation of motion using the following equations:

$$F_X(t) = -\tfrac{1}{2}(C_D(t)\cos\alpha + C_L(t)\sin\alpha)\,\rho A V_B(t)^2$$

$$F_Y(t) = -\tfrac{1}{2}(C_D(t)\sin\alpha - C_L(t)\cos\alpha)\,\rho A V_B(t)^2 - mg$$

$$N(t+\Delta t) = -\rho A d C_m(t) V_B(t)^2\,\Delta t/(4\pi I) + N(t)$$

wherein $F_X(t)$ is force applied to a ball in flight in the flight direction at time instant t, $F_Y(t)$ is force applied to a ball in flight in the vertical direction at time instant t, and $N(t+\Delta t)$ is decrease in the rotational

speed of a ball due to aerodynamic torque after interval of Δt; and

wherein C_D: drag coefficient, C_L: lift coefficient, α: elevation angle of a ball(deg), ρ: air density(kg/m^3), A: ball sectional area(m^2), V_B: ball velocity(m/sec), m: ball mass(kg), g: gravitational acceleration(m/sec^2), C_m: moment coefficient, d: ball diameter(m), I: moment of inertia of a ball ($kg\ m^2$), N: ball rotational speed(rps).

15. (new) The wood golf club head according to claim 3, wherein said ellipse is determined by solving the equation of motion using the following equations:

$$F_X(t) = -\tfrac{1}{2}(C_D(t)\cos\ \alpha + C_L(t)\sin\ \alpha)\ \rho A V_B(t)^2$$

$$F_Y(t) = -\tfrac{1}{2}(C_D(t)\sin\ \alpha - C_L(t)\cos\ \alpha)\ \rho A V_B(t)^2 - mg$$

$$N(t+\Delta t) = -\ \rho A d C_m(t) V_B(t)^2\ \Delta t/(4\pi I) + N(t)$$

wherein $F_X(t)$ is force applied to a ball in flight in the flight direction at time instant t, $F_Y(t)$ is force applied to a ball in flight in the vertical direction at time instant t, and $N(t+\Delta t)$ is decrease in the rotational speed of a ball due to aerodynamic torque after interval of Δt; and

wherein C_D: drag coefficient, C_L: lift coefficient, α: elevation angle of a ball(deg), ρ: air density(kg/m^3), A: ball sectional area(m^2), V_B: ball velocity(m/sec), m: ball mass(kg), g: gravitational acceleration(m/sec^2), C_m: moment coefficient, d: ball diameter(m), I: moment of inertia of a ball ($kg\ m^2$), N: ball rotational speed(rps).

16. (new) The wood golf club head according to claim 1, wherein a face of said wood golf club head is formed of a low friction material.

17. (new) The wood golf club head according to claim 2, wherein a face of said wood golf club head is formed of a low friction material.

18. (new) The wood golf club head according to claim 3, wherein a face of said wood golf club head is formed of a low friction material.

19. (new) The wood golf club head according to claim 16, wherein said face is coated with DLC (Diamond-like carbon), ceramic, or SiC.

20. (new) The wood golf club head according to claim 16, wherein said face is composed of DYNEEMA® FRP.

21. (new) The wood golf club head according to claim 16, wherein said face is plated with chromium or dispersed nickel.

22. (new) The wood golf club head according to claim 16, wherein said face has an insert formed of polyacetal, polyamide, polytetrafluoroethylene, polyphenylenesulfide, polyamideimide, or polyimide.

23. (new) The wood golf club head according to claim 1, wherein said face is formed of composite materials that are made from pitch-based carbon fibers and a pitch-based matrix.

24. (new) The wood golf club head according to claim 1, wherein said wood golf club head is a driver club head.

25. (new) The wood golf club head according to claim 1, wherein said wood golf club head is a driver club head, and its loft is 13 to 20 degrees.

26. (new) The wood golf club head according to claim 2, wherein said face is formed of composite materials that are made from pitch-based carbon fibers and a pitch-based matrix.

27. (new) The wood golf club head according to claim 3, wherein said face is formed of composite materials that are made from pitch-based carbon fibers and a pitch-based matrix.

28. (new) The wood golf club head according to claim 2, wherein said wood golf club head is a driver club head, and its loft is 13 to 20 degrees.

29. (new) The wood golf club head according to claim 3, wherein said wood golf club head is a driver club head, and its loft is 13 to 20 degrees.

[AMENDMENT CONTINUES ON NEXT PAGE]